The American Biology Teacher

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Audio-Visual News

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Cover Photograph

Cecropia moth. Photograph by Charles F. Walcott, Marblehead, Massachusetts.

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NABT Officers for 1957

Approximately 85 members and guests attended the Annual NABT Banquet held in the Colonial Room of the Sheraton-McAlpin Hotel in New York City, December 28, 1956 and listened to Mr. Roger L. Leatherman, Assistant to the Director, Phoenix Project, University of Michigan, speak on *Nuclear Research and Development: Implication for American Education.*

The following officers for 1957 were announced at the banquet: President, John Breukelman, Kansas State Teachers College, Emporia, Kansas; Past President, John P. Harrold, Senior High School, Midland, Michigan; President-Elect, Irene Hollenbeck, Southern Oregon College of Education, Ashland, Oregon; First Vice President, Howard E. Weaver, University of Illinois, Urbana, Illinois; Second Vice President, Frances L. Hall, Columbia University, New York, New York; Third Vice President and National Membership Chairman, Robert L. Smith, High School, DeKalb, Illinois; Secretary-Treasurer, Paul V. Webster, Bryan High School, Bryan, Ohio.

Progress Report
NABT Conferences on Biology Teaching

G. W. JEFFERS
Longwood College[1]

The National Association of Biology Teachers has promoted two work-conferences on the teaching of biology, each of ten days duration. Both conferences were made possible by grants from the National Science Foundation.

The first, called the Southeastern Conference, was held August 28-September 6, 1954, at the University of Florida, at Gainesville. The second, known as the North Central Conference, was held August 19-31, 1955, at the Biological Station of the University of Michigan, at Cheboygan, Michigan. The Southeastern Conference had ninety-four participants from ten southeastern states, while the North Central Conference had eighty-six participants from ten north central states. In each case the participants were selected to form balanced teams from each state. That is, so far as possible, each state team consisted of high school teachers of biology, college teachers of biology, those concerned with the training of biology teachers, and a public school administrator and/or a member of the state department of education.

Time will not permit us to list the objectives of the conferences, the procedures that were followed, and the recommendations agreed upon. Most conferences and institutes are enjoyable and profitable experiences for those who take part. However, in my opinion, the NABT conferences were different in one important respect, in that an honest effort was made to implement the findings of the conferences after the state teams went back home.

A year ago, at Atlanta, evidence of the implementation of the Gainesville Conference was presented in the form of a panel. The reports given at that time were impressive and heartening; an abstract of what was said appeared in the November 1956 issue of The *American Biology Teacher*. But, it appears that the fifteen months intervening between Gainesville and Atlanta were not enough time to reveal the full measure of accomplishments. As evidence that this is so, I shall take a few minutes at the end of this paper to revisit, as it were, a few of the southeastern states to show that the good work is still continuing.

Today, we follow a different procedure. Instead of a panel, I shall attempt to present a digest of what has been taking place in some of the north central states—since the Cheboygan Conference.

A College Assumes Leadership

We shall begin with Illinois—not the "great state of Illinois" as the politician would say, but only a portion of Illinois—the northern portion. Last spring a working relationship was set up between the National Association of Biology Teachers and Northern Illinois State College at DeKalb. Under the leadership of Art Baker, Bob Smith, and Bob Bullington, a two-day Conference for Biology Teachers was held at the Lorado Taft Campus of Northern Illinois State College. Sixty biology teachers from northern Illinois attended, and Doctor Alfred Wolfson, a valuable participant of the North Central Conference, came down from Northwestern to assist.

This conference proved quite successful. The enthusiasm generated was genuine and the results gratifying, so much so that the College is determined to make this get-together an annual affair.

Like so many other state teams, that from Indiana instituted a many-sided follow-up program and one of these approaches seems to be paying off handsomely. Copies of the Report were distributed and discussed in the Biology Section of the Indianapolis Public School Conference; the Indianapolis Public School Curriculum Committee used it in its curriculum reorganization; the Report was analyzed and discussed at two meetings held at Purdue University, namely, the Rural Biology Teachers Conference, and the City

[1]Presented as part of the NABT program, A.A.A.S. meetings, New York City, December 26-31, 1956.

Biology Teachers Conference; and one session of the summer institute sponsored jointly by Indiana University and NABT was given over to a consideration of the Report. The subject was taken up with Superintendent of Education, Wilbur Young, where it was favorably received. Paul Klinge brought the subject to the attention of the Indiana State Teachers Association (Biology Section), and Willis Johnson of Wabash College took it up with the Indiana Academy of Science.

The Academy acted with alacrity. Two academy committees have been set up: One, to study opportunities and present requests for grants to help Indiana teachers improve themselves. Two participants in the N. C. Conference (Catherine Dale and R. Armacost) were appointed to membership on this committee. This is a good place to mention the six-week Summer Institute for teachers of High School Biology sponsored by Indiana University and NABT, financed by a grant from the National Science Foundation. In attendance were 35 participants from Indiana and five neighboring states.

The second committee of the Indiana Academy holds out even more promise. This committee, appropriately called the "Science Teaching Improvement Committee," has as its major objective to "study ways by which science teaching in Indiana can be improved." The committee has outlined a comprehensive and ambitious program for itself which I shall not take time to read, but it parallels somewhat the national STIP program, presided over so capably by Dr. John Mayer. Wisely, it does not mean to undertake everything at once, but has decided to, first of all, concentrate upon the pre-college science program. Richard Armacost of NABT is chairman.

The Curriculum coordinator for the State of Kansas was to have been a participant at the North Central Conference, but at the last moment he was offered a much more attractive job. Hence, the Kansas Department of Public Instruction was not represented at Cheboygan.

However, John Breukelman took back the findings of the Conference and presented them to the Kansas State Department, and I am glad to be able to report that he found a receptive audience. He succeeded in enlisting the cooperation of the State Department in furnishing data as to the kind of science being taught, the preparation of the science teachers, and things of that nature. In one institution alone, no less than three men were working during the summer, putting this information together. It is now being analyzed, and before long we may expect Kansas to have the informational background that is necessary before a rational program of science instruction can be set up.

This much has already come out of it: The Kansas Department of Education has become so interested that it promises to initiate similar studies in other fields. After that, we may expect more objective consideration for future certification requirements in the sciences.

It seems to me that this sort of thing, this compilation of data, is fundamental. Enthusiasm has its place, but enthusiasm backed up with facts is well-nigh impregnable.

The North Central Conference was held in Michigan, its director came from Michigan, and one of its special educational consultants was a Michigander. It is therefore to be expected that the conference report would be widely disseminated and discussed in Michigan. And it has been—in state, regional, and local meetings, in conservation as well as education meetings. It has been used also in at least two planning committees on university campuses. The conference and its recommendations served as the basis for an address by Dick Weaver before the Biology Section of the Central Association of Science and Mathematics in Detroit, which was later published in *School Science and Mathematics* (April, 1956).

Educational Consultant, Robert Koopman, took back to the State Department of Education both his interest in and concern for the sciences, and for biology in particular. Stemming to a large extent from this interest and from this concern, there was established a state committee on Science and Technical Education. This became one of about twenty such committees set up by the State Department to advise and to stimulate interest in specific areas of instruction. The committee on science and technical education has already had a number of meetings, and now finds itself in position to advise and to coordinate science instruction for the whole state. Thus, the biology forces in Michigan find themselves in a strategic position to take advantage of future events.

Michigan's procedure turns out to be similar to that of Ohio. In both instances, the follow-up of the North Central Conference falls into step naturally with a movement already under way. The added emphasis can hardly produce other than a wholesome outcome.

When the Ohio Team returned from Cheboygan it was aware of the existence of an Academy of Science Committee already at work on problems of science teaching. Accordingly, as in the case of both Indiana and Michigan, the Ohioans who had been at the North Central Conference aligned themselves with this committee, and discovered, of course, that their plans for implementations dovetailed perfectly into those of the larger committee. In addition, the Ohio team took the usual steps to publicize the work of the conference and its recommendations.

It is for another reason that I single out Ohio at this point. I mention it because it seems to have a new idea, which other states may wish to study. Last year, the Ohio Academy of Science appointed a Director of Public Relations, with a modest appropriation attached. The function of this new office is to keep the activities of the academy before the public, rather than to go into action once a year, and to have to depend upon the Public Relations Officers of the large institutions the rest of the year. The plan is to issue dignified, carefully edited releases at least once a month, these releases to feature the scientific work of Ohioans, in the hope that some bright youngster may thereby be attracted to science as a career.

One could continue, but my time is running out. However, since this is scheduled to be a report of NABT conferences, let us take a glimpse at two or three of the southeastern states, to find out if the effects of the Gainesville Conference are still being felt.

Let us begin with Georgia.

According to a letter recently received from W. B. Baker of Emory University, the seven individuals who composed the state team for Georgia have "been working continuously on the improvement of science instruction" in that state. After making a survey of the situation, this group recommended the development of a comprehensive integrated program in science from grades 1 though 12 in the state system. The Georgia Department of Education has appointed a larger committee, calling it the Committee for Curricular Development, and using all seven members of the Georgia team as a nucleus.

The Georgia people are applying for funds for a summer institute, and even considering one for the following summer. That is, they are looking ahead. They are also taking steps to strengthen the work of the teacher training in science.

Proud as I am to hail from Virginia, I am forced to admit that Virginia does not do things in the expected manner. When the Virginia team presented its case before the State Department of Education it was given a respectable hearing, but no inkling as to the impression made. Imagine our surprise, therefore, to learn of not one, but two, extraordinary developments during the past year. First, a state coordinator of science has been appointed. But I must warn you that he is not known by that title, nor by any other designation by which one could recognize his real position. A year ago we had little hope of ever getting a change in the certification requirements for science. And yet, though I can still scarcely believe it, today a new statewide curriculum revision committee has been set up, and the president-elect of the Virginia Academy of Science is a member of that committee. Virginia moves in mysterious ways—but she moves; that is the significant thing.

Mississippi has done some unusual things during the year, in addition to the expected ones—like summer institutes, and renewed emphasis upon science in her colleges. Her emphasis upon public relations for science is overshadowed by the fact that she has enlisted the support of business organizations, analogous to the chamber of commerce, in promoting science fairs and the like.

Other states, I am sure, would like to get hold of the formula for two other novel accomplishments in Mississippi. I shall mention them only and let you draw your own conclusions. In the first place, the Mississippi team managed to get together no less than 52 school superintendents for a consideration of science in the schools. Secondly, an increase of pay for science teachers has been secured. Here is a secret formula that most of us would like to learn.

Another state that has not lost its momentum is Kentucky.

A three-day science workshop at Asbury College last June, supported by funds from the Kentucky Council on Higher Education; plans afoot for another summer institute; plans for regional science fairs; at least one master's thesis at Morehead State College on the "Requirements in Science for H. S. Graduation"; attention focused upon recruitment in science.

Praiseworthy as these accomplishments are, they are matched if not overshadowed by achievements in other areas. Especially noteworthy is the fact that the science teachers of the state are now fully organized, not merely on a statewide basis, but also by regions. There is now, for the first time, a science organization in each of the eleven educational districts of the state.

Finally, a person is now employed in each of four state colleges in the capacity of consultant for in-service teacher training. It is questionable if any other state in either the North Central or the Southeastern regions can match what has been done for science in the Blue Grass State.

But I must bring these hasty sketches to a close. You must admit, I think, that much is happening, and the outlook for science education is encouraging. Of course, no one would be so rash as to affirm that all of the things I have recounted have resulted either directly or indirectly from the two conferences sponsored by NABT and financed by the National Science Foundation. It would be equally unwise to say that none of them resulted therefrom. Who gets the credit is immaterial. What is significant, I think, is that there seems to be a definite groundswell in favor of science in public education.

The reports and recommendations of the two conferences have been widely disseminated and widely used. They have been used both as a sparkplug and as a fulcrum: as a sparkplug for get-togethers, and discussions, and as a fulcrum to accelerate slow-moving officialdom.

Finally, the reports have been accepted as the latest and the best findings in science education and of biology in particular. In many teacher-training programs the reports have been used as text material. They also have affected decisions of curriculum committees in a number of states and communities.

OUCH!

ROBERT A. HODGE
James Monroe High School, Fredericksburg, Virginia

Being a biology teacher endows one with all knowledge of living things, or so the students believe. I was, therefore, a discredit to the profession when a youngster brought in a two-foot pine snake, and during our examination I was unable to answer his question, "How hard can it bite?" Indeed, until that moment I had never given much consideration to "How hard" any snake could bite. I told him I hadn't the slightest idea, and, unless he could find someone who had been bitten, I didn't know who could answer his question.

The thought kept going through my mind: "How hard *could* that thing bite?" I looked at the snake over and over. Its two-feet seemed to stretch into at least three. I thought back to the earlier examination when we opened its mouth to check for fangs, a precaution we always take "just in case." At that time I hadn't noticed its mouth being so unusually large, but now I was sure it could have easily swallowed a frankfurter.

I asked the biology teacher in the next room if she knew how hard a snake could bite. She replied, "No, but my husband was bitten once by a very large blacksnake and the wound bled terribly for a while."

I recalled that I had been brushed by the mouth of a blacksnake once on a field trip when I reached for it while an instructor was holding it. I couldn't recall any pain, but then it had just brushed its mouth against me, not actually bitten me.

I went home at dismissal time, and asked my wife, who had had some field work in zoology, if she had ever been bitten? Her reply was no.

I read through my snake reference books again, and no where did I find any account of "how hard" a snake could bite.

The foolish thought passed through my mind that I should let the little snake bite me to see how hard it could bite. That would answer the question, and very scientifically, too. But whatever in the world made be think such a foolish thought as that!

Collecting the bandaids and merthiolate from the medicine cabinet with trembling

(*Continued on page 54*)

Establishing a Plant and Wildlife Area in a City[1]

IRVING C. KEENE

Brookline High School, Brookline, Massachusetts

I would like to begin this paper by discussing why there is a growing need for the establishment of Plant and Wildlife Centers in our urban areas.

Most of us will agree that what a high school biology student can see, touch, smell, and work with, he will retain a lot longer than what he reads in a text book. Undoubtedly, a student will learn faster from a text book but will he retain that knowledge as long as he would through observation? I do not want to infer that I oppose text books. They are very much in evidence in my course. However, we should constantly be trying to find new methods and techniques in teaching.

My first reason in believing in these Centers is that our students are changing rapidly in a changing world. Today, they are much more alert and more eager to find out things for themselves than ever before. They are seeing and hearing much more of our science than they ever did in the past. We must admit that television is affecting the learning habits of our youth. There is hardly a day goes by that one of my students does not tell me about some program concerning biology that he has seen. Students even call me at my home to tell me to look at a program that will go on shortly. Is not this the kind of interest we want our students to show?

Wherever I travel I ask high school students if they are taking or have taken biology. There are some who are not as interested as we would like to have them. The chief reason seems to be that the teacher taught a text book course with home assignments each night to be followed by a test on what was read. Another complaint is that the teacher dictated notes all period. Did you like to write notes all period when you were 15 or 16 years old? Are we losing potential biologists because of such antiquated teaching methods? We must consider our changing youth and constantly search out new techniques in teaching.

[1]Presented as part of the NABT program, A.A.A.S. meetings, New York City, December 26-31, 1956.

The second reason why Plant and Wildlife Conservation Centers in city areas are worthwhile is the interest they arouse. Interest is the key to learning and without interest there is little or no learning. We must constantly strive to use those techniques that will lead to interest in biology.

Students like to go out-of-doors. The minute it is suggested, their faces light up. I am fortunate to teach in a school that is in a highly residential area. There are many trees, shrubs, flowering plants, beautiful gardens, and considerable animal life in the area. Possibly your school has a variety of living things nearby where a class period can be spent profitably in the out-of-doors.

Some teachers object to taking a class out-of-doors because of discipline problems. I find quite the opposite. If the activities are well planned, there is little time for discipline problems. Students know they will be tested on the things we discuss, so they are alert. They are also interested, which helps them learn.

As chairman of Natural Areas for School Grounds in Massachusetts, sponsored by Nature Conservancy, we are trying to convince city and town School Planning Boards in considering new school sites that they should not let the bulldozers destroy all natural areas. They should leave a few places where the students taking science can have out-of-doors classrooms. The following questionnaire is being sent out, with the results up to date indicated. There are not enough replies as yet to measure accurately the results of the survey but it will give some idea of teacher-thinking on the matter.

1. How many times a year do you take your classes out-of-doors during class periods?

   Times 0 - 1 - 2 - 4 - 8 - 12 - 16
   No. of Answers 16 - 8 - 5 - 10

2. How many times a year do you take your classes out after school hours?

   Times 0 - 1 - 2 - 4 - 8 - 12 - 16
   No. of Answers 21 - 10 - - - 8

3. Are you allowed, during school hours, to take your classes on all day field trips?
   Yes - 18
   No - 21
4. If transportation is needed, who pays the cost?
   School - 14
   Student - 25
5. Do you consider an out-of-doors class period more taxing than one inside?
   More - 15 Same - 9 Less - 15
6. Are the elementary school children taken out-of-doors in your system?
   Yes - 30
   No - 9
7. If the elementary school children were taken out-of-doors more, do you think it would increase the interest in high school biology?
   Yes - 37
   No - 2
8. Are there trees, shrubs, flowering plants, or a pond on your school grounds?
   Answers - 37 - 37 - 35 - - - 8
9. Which of the following creates most interest on a field trip? Results in order:
   1. Pond life, 2. animal life, 3. swamps, 4. flowering plants, 5. Trees, 6. shrubs.
10. Are you in favor of natural areas in your community?
    Yes - 39
    No - 0
11. Is there a natural area or park in your community?
    Yes - 39
    No - 0
12. How far would your classes have to travel to reach a natural area?
    Answers: From 100 yards to 6 miles. Average - 3 miles
13. Would it be possible for your community to have a natural area?
    Yes - 37
    No - 2
14. In building new schools, does your city or town attempt to preserve natural areas on the school grounds?
    Yes - 15
    No - 24

Thus with the view in mind that our biology students of today are constantly changing and with the hope of creating more interest in our course, through learning in the out-of-doors, I have been working with the aid of the four Garden Clubs of Brookline, Massachusetts, to establish a Plant and Wildlife Conservation Center in our community. As you know, there are countless learning activities that can be carried on at the Center. Trees, shrubs, wildflowers, animal life, both in the ponds and on the land, ecological studies, and conservation problems are just a few to mention here. Will students not retain this knowledge longer than by reading in a text book or writing in a notebook?

This Center will be used by our elementary grades as well as at the high school level. The enriching experiences that they will receive here should carry over into the high school. If interest in the living world can be generated in the lower grades, just think how it will improve the quality of our high school students. Other uses of the Center will be to provide materials for our course and afternoon field work.

Brookline, Massachusetts, has a population of about 57,000. It is located on the outskirts of Boston and is highly residential. About ten years ago, the late Mrs. Larz Anderson left her estate of 65 acres to the town to be used as a park for recreational and educational purposes. The southwest corner has a five-acre tract with two ponds located at the bottom of sloping hills. There is considerable bird life and some mammals in the area. I am indeed fortunate to teach in a town that had this land available and whose authorities were asking advice of its citizens as to its use. This was a challenge to any biology teacher who believes in teaching a living course.

Working alone for the establishment of this Conservation Center did not prove to be very successful. This was something new for this region. I was pioneering and the road was rough at first. I enlisted the aid of our Garden Clubs. These ladies saw the value of natural areas for our boys and girls. Finally, after much hard work on the part of many, the Park Board granted the use of this five-acre plot as a Plant and Wildlife Conservation Center.

Within my Biology Club and classes, there were many students who were extremely interested in this project. They formed a section in the Club, calling themselves the Con-

servationists. We went to work at the Center, blazing a Nature Trail and making nature signs. This work is still in progress. This Nature Trail will be valuable to the public as well as to our youth.

We have found experts from our State Department of Natural Resources, Garden Club members, Wildflower Preservation Society and Sportsmen groups willing to help in any way, even in leading classes on nature walks. In a small way, these areas are interesting our public in our National Parks. They also interest them in the values of out-of-doors education. After all, they are the ones who pay the bill. We spend thousands of dollars to build biology laboratories in our schools yet for a small amount any community can build and support an out-of-doors classroom.

May I suggest, if you see the value of Conservation Centers, that a call at the city or town hall might uncover small plots of unused land, owned by the community where such an area can be started.

In conclusion, these areas should be established in your communities soon, for all available land is being used fast. Remember, when the bulldozers move in, our natural areas vanish.

8th Grade Students Use Plastics as Aid in Science Units

HAROLD HAINFELD

Roosevelt School, Union City, New Jersey

The disagreeable odor of preservatives and the disintegration of specimens cause science teachers on the upper elementary level some problems. Unfavorable student reaction to these unpleasant odors and deterioration of dead animals can cause a loss of interest in phases of science at an age when the opposite effect is desired.

To increase student interest in specimens, your author tried a somewhat newer approach with 8th grade students. The use of thermosetting plastics to embed specimens in transparent blocks is helpful in overcoming the problems mentioned. Interested students have assisted in preparing these mounts.

The clear liquid plastic (Ward's Bio-Plastic) was used for our projects. The Industrial Arts teacher assisted by making a mold 5 x 4 x 2 inches to hold the plastic and specimen. After adding a few drops of hardening agent as a catalyst, the liquid plastic is poured into the mold and heated to a temperature of 110-115° F., for a period of 20 to 30 minutes. The result is a clear block of transparent plastic.

The object or specimen to be embedded is placed on this block in the mold. Another quantity of the liquid plastic is added to cover the object being embedded. The heating process is repeated, the result is a specimen embedded in plastic. The student can see the material without odors or disintegration. The entire class can view the specimen by using the opaque projector.

The oven used was a box, the heat being supplied from two 100-watt bulbs. A small wire screen was placed just above the bulbs and the mold placed on the screen.

Another plastic, which hardens in the air at room temperature, has other possibilities for the upper elementary grades. I have not seen the material advertised in science supply catalogs, but in arts and crafts catalogs under the name of Spantex. Outline shapes of flower petals and insect wings and bodies are made using brass wire or wire from the top of milk bottles. The student dips the wire outline into this liquid plastic. When removed, the wire is held in the air for two or three minutes. A clear hardened plastic forms between the wire outline.

With the use of artificial stamens, pistils, colored cloth tape and paint, it is possible to construct many insect and flower specimens. More information about this type of plastic can be obtained from your local arts and crafts supplier.

The use of transparent plastics for embedding specimens and for making insect and

flower models offers many possibilities for visualizing science at the upper elementary grades. It permits the students to see and better understand concepts in their early science education. It enables the students to make a valuable contribution to the growing technique of a visual science—using the student participation method. This is not intended to replace or substitute for living materials, which are used at every possible opportunity.

Foliage As an Indicator of Soil Deficiency A Practical Laboratory Experiment With Teaching Value

LUTHER S. WEST and JAMES M. KANE*
Northern Michigan College, Marquette, Michigan

The project here described was devised and carried out with the purpose of providing educational display material for the Northern Michigan Science Fair, held at Marquette, Michigan, in April, 1956. It attracted considerable attention and received favorable comment, both of a verbal nature and in news reports. Photographs of apparatus and of specimens were later displayed at the annual meeting of the Michigan Junior Academy of Science Arts and Letters, held at Hillsdale College.

Since our results were so definite and satisfactory, it is felt that other teachers of biology may be interested in the techniques used. With various modifications, experiments of this type are suitable for use as group projects at the high school level (West 1956).

The species chosen for this demonstration was the common tomato, *Lycoperscion esculentum* var. Wisconsin No. 55. Hydroponic culture methods were employed.

Construction of the Apparatus

Two rectangular troughs were built, of soft pine boards. Each was then divided into four compartments to make a total of eight units, twelve inches square and eleven inches deep. A tray, three inches deep, with a wire-cloth bottom of half-inch mesh was then fitted into the top of each compartment, and supported by horizontal cleats.

All seams were caulked with aquarium putty, and all interior surfaces were painted with a special acid-alkaline resistant asphalt base paint. Over this a wax coat was applied to prevent possible toxic effects upon the plants from paint or wood exudates. Each compartment was next fitted with a *level indicator*, to facilitate the maintenance of nutrient solutions at the desired six-inch depth. The required volume of liquid for each compartment proved to be 12,771 cc. This provided for a two-inch aeration space between the nutrient solution and the wire-cloth bottoms of the trays.

Each unit was also fitted with a drainage valve by which the nutrient solutions could be lowered or removed. It was our practice to drain the units every two weeks and refill them with new solution, in order to keep the nutrients at optimum concentration.

The Seedbed

Wood excelsior, to a depth of two inches was laid upon the wire-cloth netting. Excelsior was chosen for this purpose because of its high lignin and cellulose content, as both these substances may be considered chemically inert in the nutrient solutions which we used. Any abnormal characteristics later manifested by the growing plant could not therefore be interpreted as due to the seedbed itself. The loose, open texture of the excelsior also favors ready penetration by the seedling roots.

Nutrient Solutions

Distilled water is not considered suitable either for seed germination or for the growth of young plants (Hoagland 1948; Palladin

*Student assistant in Agriculture and Conservation. In recognition of his work in connection with this project, Mr. Kane received a 1956 merit award from the Michigan (Senior) Academy of Science, Arts and Letters.

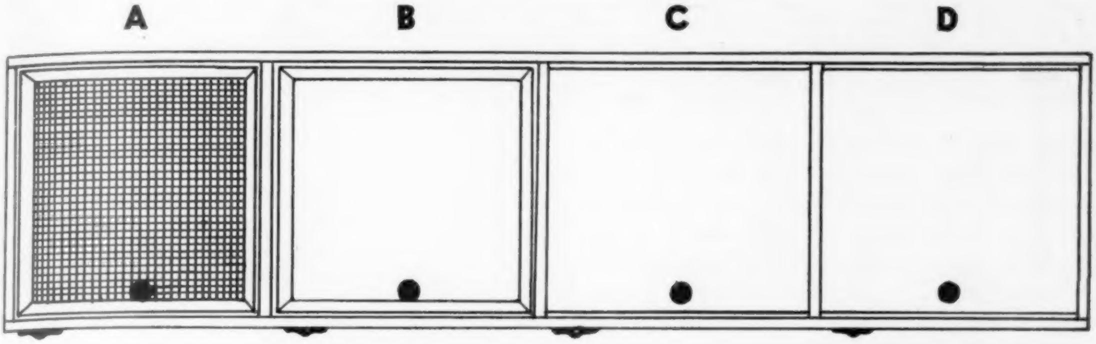

Figure 1. General view of growing trough, from above, showing four compartments of equal size. A. With tray in place; complete, with wire-cloth bottom. B. Box of tray, as tested for fit, prior to attachment of wire-cloth bottom. C, D. Empty compartments, with supporting cleats on front and rear walls. Black discs represent rubber stoppers in drain holes.

1914). Due to usual methods of preparation it may contain small traces of toxic substances. Also, it tends to remove salts from plant tissues by outward diffusion. In the work here reported, water from Lake Superior was used. The calcium content of this lake is given by Clarke (1924) as ranging from 12 to 14 parts per million, with the bicarbonate radicle falling between 52 and 60, according to the month of sampling. Because of the calcium bicarbonate in solution it was necessary to add a small amount of acid in order to establish the desired pH. For best results this should not fall below 5.0 nor exceed 6.5. Our newly prepared nutrient solutions usually tested close to 5.5, but this tends to advance to 6.0 as the solution becomes less concentrated (Dawson, 1938). A standard pH meter was used in determining pH values in these experiments. However, nitrazine test papers are quite as satisfactory for this purpose, and can be purchased from most druggists, along with the color chart necessary for their use.

Although pure chemicals are not required in rearing normal plants hydroponically (Gericke, 1940), C.P. preparations were used in this experiment in order to guard against the effect of unknown ingredients on the physiological nature of the solutions. All solutions other than the control, are designated below as "manipulated formulae."

In actual procedure, each compound was

Control Formula

For growing the control plants we employed the formulation developed by the California Agricultural Experiment Station (Hoagland and Arnon, 1950). Except where otherwise indicated, molar stock solutions were prepared for each salt. The basic formula has the following content:

Compound	*cc. in a liter of Nutrient Solution*
M KH_2PO_4	1
M KNO_3	5
M $Ca(NO_3)_2$	5
M $MgSO_4$	2

Two supplementary solutions are also required. Of these, solution "A" supplies boron, manganese, zinc, and copper. It is prepared as follows:

Compound	*Grams dissolved in 1 liter of H_2O*
H_3BO_3	2.86
$MnCl_2.4H_2O$	1.81
$ZnSO_4.7H_2O$	0.22
$CuSO_4.5H_2O$	0.08

In actual procedure, each compound was prepared separately, and 1 cc of each solution used per liter of growing solution. This gives the desired concentration in parts per million, namely:

*Boron	0.5
Manganese	0.5
Zinc	0.05
Copper	0.02

Solution B provides iron. This was added in the form of 0.5 per cent iron tartrate solution at the rate of 1 cc per liter, twice each week, as the experiment progressed.

The reaction of the combined nutrient solution was adjusted to approximately pH 6 by adding 0.1 N H_2SO_4.

*It should be pointed out that these elements will prove toxic to plants if present in greater than minute amounts.

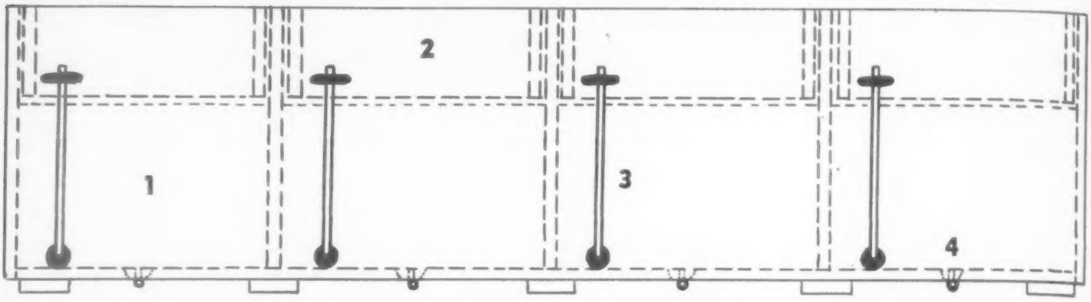

Figure 2. Diagrammatic (front) view of growing trough, showing special features. 1. Basin for holding nutrient solution. 2. Growing tray, with wire-cloth bottom. 3. Level indicator. 4. Drainage valve.

Manipulated Formulae

Seven special formulae were prepared, each lacking a different essential element. The composition of these solutions was as follows:

Manipulated Formula I
(solution lacking nitrogen)

	cc in a liter of solution
0.5 M K_2SO_4	5
M $MgSO_4$	2
0.5 M $Ca(H_2PO_4)_2$	10
0.01 M $CaSO_4$	200

(add proper amounts of stock solutions A and B)

Manipulated Formula II
(solution lacking potassium)

M $Ca(NO_3)_2$	5
M $MgSO_4$	2
0.05 M $Ca(H_2PO_4)_2$	10

(add proper amounts of stock solutions A and B)

Manipulated Formula III
(solution lacking phosphorus)

M $Ca(NO_3)_2$	4
M KNO_3	6
M $MgSO_4$	2

(add proper amounts of stock solutions A and B)

Manipulated Formula IV
(solution lacking calcium)

M KNO_3	5
M $MgSO_4$	2
M KH_2PO_4	1

(add proper amounts of stock solutions A and B)

Manipulated Formula V
(solution lacking magnesium)

M $Ca(NO_3)_2$	4
M KNO_3	6
M KH_2PO_4	1
0.5 M K_2SO_4	3

(add proper amounts of stock solutions A and B)

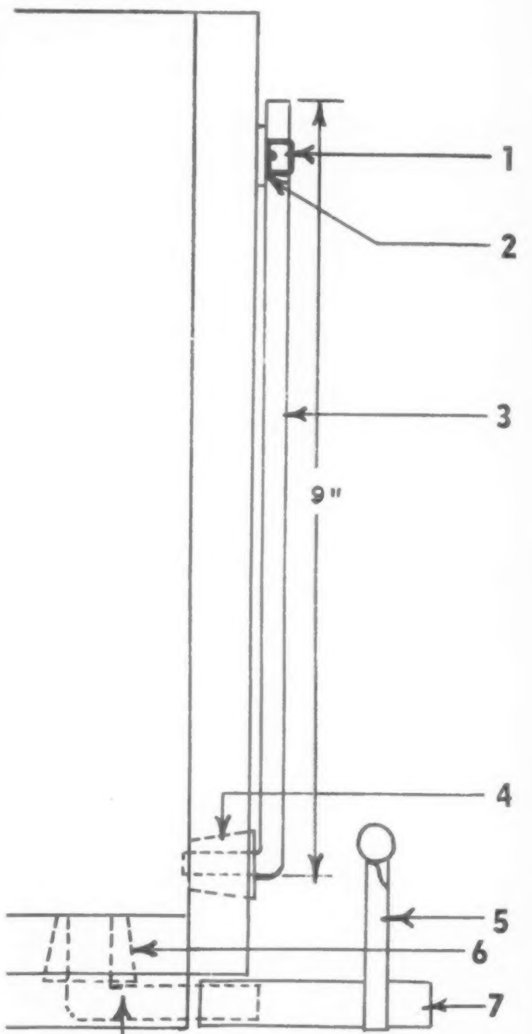

Figure 3. Level indicator and drainage valve assembly. 1. Metal clip 2. Rubber strip 3. One-quarter inch glass tube 4. One-hole stopper (No. 1) 5. Mohr's spring clamp 6. One-hole stopper (No. 5) 7. Rubber tubing 8. One-half inch glass tube.

Manipulated Formula VI
(solution lacking boron)
M KH_2PO_4 1
M KNO_3 5
M $Ca(NO_3)_2$ 5
M $MgSO_4$ 2
(add proper amounts of stock solutions A and B, with the exception of boron of stock solution A)

Manipulated Formula VII
(solution lacking manganese)
M KH_2PO_4 1
M KNO_3 5
M $Ca(NO_3)_2$ 5
M $MgSO_4$ 2
(add proper amounts of stock solutions A and B, with the exception of manganese of stock solution A)

As with the control solution, iron in the form of 0.5 iron tartrate was added periodically to each solution described above.

A different nutrient solution was introduced into each compartment of the growing troughs which at first were filled to the level of the wire-cloth bottoms. One control and seven experimental units were thus provided.

Preparing the Plants

The seeds were allowed to germinate in sterile quartz sand. On February 2, 1956, eight seedling plants, of uniform development were selected from approximately thirty-five of the same germination lot. These eight were essentially identical in height, foliage, and root development.

The seedlings were washed free of soil particles and placed upon the eight seed beds previously prepared. Each day one pint of each nutrient solution was drained off from below and poured through the corresponding seed bed in the vicinity of the developing roots. On or about the third day the roots of the young tomato plants made contact with the surface of the nutrient solution and pouring was discontinued. As the root systems developed, the solutions were progressively lowered until the desired air space (two inches) was established between the liquid and the seedbed. This level was maintained throughout the experimental period.*

Adverse effects of nutritive deficiency became manifest in three ways:

1. Color changes in the leaves.
2. Abnormal outline of the leaves.
3. Developmental pattern.

The public display at which the demonstration was aimed took place on April 14, 1956. Although more extreme symptoms developed later, all types of injury were clearly manifest at this time, ten weeks and two days after the seedlings' first exposure to differing nutritive conditions. A comparative tabulation of the various abnormalities appears below:

Tabulation of Results

Type of Deficiency	
NITROGEN LACKING MANIPULATED FORMULA I	1. Plants remain diminutive. 2. Leaves are smaller than normal. 3. Leaves gradually turn yellow. 4. Oldest leaves (those nearest roots) are first affected. 5. Veins become distinctly purple. 6. Affected leaves soon die. 7. New leaves are green at first, showing that new tissues have priority on limited food supply. 8. Whole plant eventually turns yellow and dies.
POTASSIUM LACKING MANIPULATED FORMULA II	1. Young foliage breaks down prematurely. 2. Leaves are inclined to droop. 3. Yellowing starts at tips and edges of leaves. 4. Leaf edges turn brown and break off as yellowing reaches central and basal areas. 5. Veins retain green color. 6. Tissues seem abnormally dry. 7. Growth is generally retarded.
PHOSPHORUS LACKING MANIPULATED FORMULA III	1. New growth is depressed and plants are stunted. 2. Undersides of leaves show dark green to purplish coloration. 3. Stem and branches manifest abnormal stiffness. 4. Midrib of leaf curls downward and leaflets curl inward.
CALCIUM LACKING (Except for minute amounts in lake water) MANIPULATED FORMULA IV	1. Leaf tips hook downward and soon die. 2. Leaf margins show a cut-out appearance. 3. Plants become weak and flabby. 4. Distal portion of stem becomes spotted with necrotic areas. 5. Upper leaves (at first darker green than normal) become yellow at edges, dry up, and drop off. 6. Lower leaves tend to remain normal.

*More than this amount of space is undesirable, as it may result in hardening of root tissue, with subsequent wilting of the plant.

MAGNESIUM LACKING MANIPULATED FORMULA V	1. Considerable growth precedes appearance of abnormal symptoms. 2. Leaves tend to turn (or cup) upward. 3. Leaves and stems are extremely slender. 4. Leaves become mottled with light green, yellow or white. 5. Mottling begins at leaf margin and spreads inward, between veins, which may remain green. 6. Symptoms are most pronounced at base of plant.
BORON LACKING MANIPULATED FORMULA VI	1. Plant loses lustre. 2. Leaves show purplish spotting. 3. Spots spread and join to involve entire leaf. 4. Leaves may take abnormal shape. 5. Tip of leaf may remain alive after base has broken down. 6. Terminal buds turn brown, followed by death of adjacent parts. 7. Growth of plant is terminated.
MANGANESE LACKING MANIPULATED FORMULA VII	1. Enlarged veins form network about the very thin leaf tissue. 2. Leaves show scattered, necrotic spotting. 3. Veins tend to retain green color. 4. Apical leaves may become entirely yellow. 5. *Young* leaves and branches are chlorotic from the beginning, and may never attain normal, green color. 6. Basal leaves are least affected (opposite of *Magnesium* deficiency).

Summary of the Experiment

1. All of the seven experimental plants differed from the control and from each other in one or more respects.
2. Each type of nutrient deficiency produced physiological changes which became physically apparent as a definite deficiency symptom or set of symptoms.
3. *Color changes*, of one type or another, characterized all types of nutrient deficiency.
4. In general, the *growth* of *all* plants raised on incomplete nutrient solutions, was retarded.
5. It is apparent that all seven of the elements tested are essential for the optimum growth of tomato plants.

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The Pluck in Laboratory

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I use fresh "plucks" for a laboratory exercise to get a better understanding of certain aspects of the circulatory and respiratory systems. The heart, lungs and liver connected by the blood vessels constitute the pluck. To save money, I buy from a slaughterhouse the lamb pluck minus the liver.

There are many things to be learned from these organs in the space of a 50-minute class period:

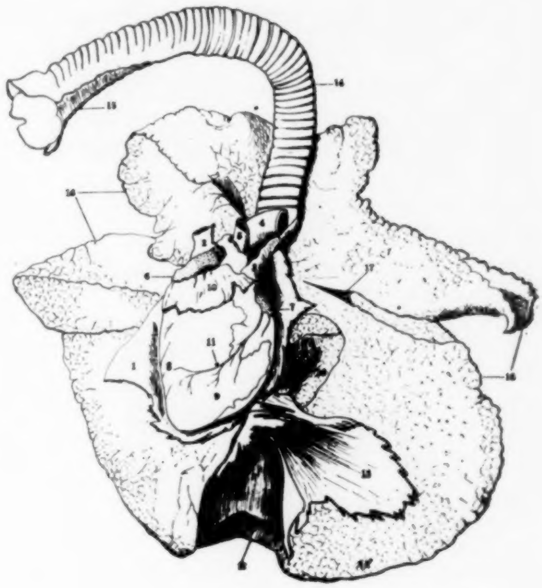
1. The natural color of these organs is noted.
2. The pericardial sac can be shown around the heart.
3. The coronary vessels of the heart are obvious.
4. The fat deposited about the anterior part of the heart is clear.
5. The difference in the thickness of the walls of the right and left ventricles is apparent by squeezing them between the fingers.
6. The appearance of the auricles as structures that seem almost distinct from the rest of the heart is surprising to the students.

The Pluck
DORSAL VIEW LEGEND

1. Movable finger
2. Fixed finger
3. Palm
4. Chela (hand)
5. Pedipalp
6. Brachium (tibia)
7. Humerus (femur)
8. Trochanter
9. Coxa
10. Median eye
11. Coxa
12. Trochanter
13. Femur
14. Leg
15. Patella
16. Tibia
17. Protarsus
18. Tarsus
19. Tarsal joints
20. Claw
21. Dorsal keel
22. Superior lateral keel
23. Seventh pre-abdominal segment
24. Fourth caudal segment
25. Vesicle
26. Subaculear tooth
27. Aculeus
28. Telson
29. Anus
30. Cauda (Post-abdomen)
31. Abdomen
32. Pre-abdomen
33. Trunk
34. Cephalothorax
35. Lateral eyes
36. Chelicera

VENTRAL VIEW

1. Maxillary lobe I
2. Maxillary lobe II
3. Sternum
4. Genital plate (or operculum)
5. Coxa (4th leg)
6. Basal piece
7. Anterior lamellae
8. Median lamellae
9. Pectine
10. Fulcrum
11. Tooth
12. Stigma (spiracle)
13. Keel
14. Seventh abdominal segment
15. Trochanter (4th leg)
16. Coxa (4th leg)
17. Trochanter (3rd leg)
18. Coxa (3rd leg)
19. Trochanter (2nd leg)
20. Coxa (2nd leg)
21. Coxa (1st leg)
22. Trochanter (1st leg)
23. Coxa (1st leg)
24. Coxa (pedipalp)
25. Chelicera



The Pluck

Specimen of pluck, ventral surface: 1. Pericardial sac, opened. 2. Vena cava. 3. Pulmonary artery. 4. Aorta. 5. Precava from aorta. 6. Right auricle. 7. Left auricle. 8. Right ventricle. 9. Left ventricle. 10. Fat. 11. Coronary vessel. 12. Diaphragm, muscular portion. 13 Diaphragm, central tendon. 14. Cartilaginous rings of trachea. 15. Dorsal tracheal region where tracheal rings are incomplete. 16. Lung lobes. 17. Pleura.

7. The thickness of the auricular walls can be told by feeling them. By inserting the index through the vena cava into the right auricle, the student may hold the auricular wall between thumb and index.
8. The student may test the elasticity of the aorta by forcing a finger into it. It stretches as he forces in his finger. When he withdraws his finger slowly the aorta has enough spring in it to snap off independently when all but about ¼ inch of the finger has been withdrawn.
9. The collapsed, thin-walled vena cava can be contrasted to the firm, muscular-walled aorta.
10. The valves of the heart and main vessels leaving the heart are easily demonstrated by incising the right and left ventricles as well as the pulmonary artery and aorta. At this point the papillary muscles may be examined.
11. The pleural membrane around the lungs may be seen in the spaces between certain of the lobes of the lungs.
12. The structure of the trachea can be examined, noting the cartilaginous bands incomplete dorsally where the trachea is adjacent to the soft esophagus.
13. The soft, spongy nature of the lung tissue is apparent by squeezing a part of the lung between the fingers.
14. The bronchi are easily seen at the base of the trachea.
15. The subdivisions of the bronchi into the bronchial tubes may be demonstrated by splitting the bronchi and sectioning a lung lobe.
16. The bouyancy of lung tissue may be shown by floating a small section in a bowl of water.
17. Usually most of the diaphragm remains with the pluck, and students are able

to compare the fleshy muscular perimeter with the thin central tendon.

This laboratory study of the sheep heart and lungs is a part of a unit on the circulatory and respiratory systems. Prior to the laboratory period, the class had completed text readings on the circulatory and respiratory systems. We had discussed the structure, function and interrelationships of the heart and lungs. We had examined certain textbook drawings and had supplemented this with blackboard diagrams during discussion periods. The class had also seen a short film, "The Heart, How It Works," illustrating blood circulation through the heart and lungs as well as valvular mechanics of the heart and the mail vessels leaving the heart.

I use the first five minutes of the 50-minute period to go over one pluck, pointing out the structures and reviewing their functions. Students gather around the desk in a semicircle to see better. They then take their seats for their laboratory work for which the instructions are on the blackboard. The students work in pairs with one set of heart and lungs per pair. First they examine and identify the structures. During this time, I check the individual students to help any having trouble identifying structures and relating structures to function. At this point, depending on class size, two or three of the better students are willing to help and take pride in helping other students having difficulties. Next, they make a labeled drawing of the ventral aspect of the heart and lungs.

Here are some of the difficulties they had: The collapsed vena cavae were hard to locate in a few cases. The pulmonary artery was hard to identify because of its whitish, fat-like color and the fact that there are no cut off open ends showing.

Following the laboratory exercise with the pluck, they see a second film entitled "Modern Medicine Looks at Your Heart," where a doctor uses a teaching model of the heart to demonstrate structure and function. The students see him identify and discuss all of the structures they had examined on the pluck in laboratory.

I find that the pluck catches their interest and helps to round out the picture of the relationship between the heart and lungs.

Biology in the News

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ARE YOU EATING YOUR WAY TO A HEART ATTACK? Steven M. Spencer, *Sat. Evg. Post*, Dec. 1, 1956, pp. 23-25, 99-102.

How much fat should a person eat? What effect has the fat in our diet on the condition of our blood vessels? This impressive article can spark a lot of discussion on these questions.

DISASTER IN THE SOUTHWEST, Lewis Nordyke, *Sat. Evg. Post*, Dec. 1, 1956, pp. 34-35, 103-104.

A report on one of the worst droughts in the history of Texas. A dramatic account of the results of decreased rainfall.

DRUMMER BOY OF THE WOODLANDS, George Heinold, *Sat. Evg. Post*, Nov. 24, 1956, pp. 49, 96-100.

The curious life of the ruffed grouse who woos his ladylove with a boogie beat.

NEW WAR ON HIT-AND-RUN KILLERS, Joseph N. Bell, *Sat. Evg. Post*, Dec. 15, 1956, pp. 19-21, 102-104.

What happens when the driver leaves the scene of an accident? What should be done to stop hit-and-run activities? This article suggests ways to solve this safety hazard.

THE STRANGE LIVING FOSSILS OF AUSTRALIA, photographs by John Dominis, *Life*, Jan. 7, 1957, pp. 40-49.

Wonderful color photographs of the marsupials of Australia which you will want to display on your bulletin board. Be sure to get an extra set for your permanent file.

THEY MAKE THE BLIND SEE, *Cosmopolitan*, December 1956, pp. 62-67.

An account of the activities at Wills Hospital in Philadelphia. For over a hundred years this institution has been a leader in the repairing of eyes defective because of improper development, disease and accident.

I WENT BLIND AT 43, Skulda Baner, *Ladies Home Journal*, Dec. 1956, pp. 79, 170-175.

The personal reactions of one who lost the power of vision and regained freedom of movement with a Seeing-Eye dog.

Report on Meeting of the Cooperative Committee on the Teaching of Science and Mathematics

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The Cooperative Committee on the Teaching of Science and Mathematics of the AAAS was held in the new AAAS building in Washington, D. C., on October 11 and 13, 1956. The following items are of particular interest to members of the NABT and should indicate how the NABT benefits by having a member attend these cooperative meetings.

The Science Teacher Improvement Program (STIP) has continued to encourage the professional education of all science teachers. The work started in 1955-56 in the colleges and universities will be continued. It is hoped that a plan can be developed for the promotion of this activity on a regional basis, for which leadership will be obtained from scientists working in their own region. The plan calls for 18 regions and each regional consultant would have an annual budget of $300. The cooperation with professional education groups will be extended to include further work with organizations on projects already started and new activities with other groups. Scientists are being invited to work with the Teacher Education and Professional Standards Commissions in every state to assist in formulating proper certification standards. The AAAS in cooperating with the NAS-NRC Educational Advisory Review Board in a review of the use of television in science teaching. STIP is planning to cooperate with NEA on a special study of merit salary increases.

An interesting proposal has been received from Ventura County, California, in aiding the working conditions of teachers. This proposal covers purchase of equipment and library materials which will be used in projects involving science teachers in research. The science counselor service has been started at Penn State University, University of Nebraska, University of Oregon and the University of Texas. This is the plan whereby selected counselors, two from each university, visit approximately 25 schools each at several times during the year, to aid those science teachers who can benefit from meetings with university personnel. Plans are under way for special regional conferences of state colleges in the Midwest to consider ways of improving science and mathematics teacher education programs and relationships with secondary schools. Support has been given to the development of Junior Academies, Science Fairs and Science Clubs.

As a result of discussion following the report of the subcommittee report on Accreditation and Teacher Certification it was suggested that minimum standards for certification of science teachers be developed and that these standards be such that they can be supported by professional scientific groups. A committee was formed to develop a recommended sequence of courses for the training of secondary school teachers of science. Plans are under way to determine how the Federal Government might assist science teaching.

Reports were made of the 85 summer institutes for 1957. The list of these institutes will have been made known by the time this is published and all science teachers are urged to consider these opportunities offered, at little financial burden, to improve their professional background. Sixteen year-long institutes for 1957-58 are also planned, although many of these are on the university and college teaching level. The National Science Foundation has a program for granting stipends to enable teacher and college undergraduates to do summer work at biological experiment stations.

Much time was devoted to discussing the value of films in teacher training. The University of Houston plans to film its freshman course in biology. A proposal has been re-

ceived for a conference of science teachers and others interested in films and television programs dealing with science. A subcommittee was appointed to study the advisability of preparing films for use in teacher training, both pre-service and in-service, and to determine if these films could include hints on setting-up demonstrations. A study conducted by the Michigan State University to compare the relative teaching effectiveness of television, black and white movies, and color movies, indicated that color movies were the most effective of the three media.

The AAAS Traveling Science Library Program has been expanded to include 200 schools. Teachers might suggest to PTA groups the need for good science books in libraries and the parents groups could use this as a means of assisting the school. The advantages of the science library are being studied by other groups and soon various professional organizations are expected to initiate their own traveling libraries for schools of small enrollment.

A study is under way to consider means of obtaining better laboratory equipment and more reasonable prices. The high prices and outmoded equipment offered by many supply houses is hampering science teaching to such an extent that some secondary schools are dropping the laboratory phases of science completely. Possibly a fund might be set up to help schools obtain needed laboratory equipment with government and industry as possible donors. Even better, if the American manufacturers of laboratory equipment would modernize their products more students could benefit from laboratory studies.

The next meeting of the Cooperative Committee will be held in Cleveland on March 23 and 24, 1957, in conjunction with the NSTA convention. At an executive meeting of the NABT just held at the New York convention, it was strongly urged by the President John Harrold that more ideas for improving the lot of biology teachers be suggested to the NABT representative, since these meetings with the Cooperative Committee are achieving excellent results in a comparatively short span of time. Any suggestions that members of NABT should want to present at the next meeting should be sent to the author by March 15, 1957.

OUCH!

(Continued from page 42)

hands, I bade my wife farewell. I was off to the second biology teacher's home to see if she would capture the villain if my venture was fatal!

She thought I was crazy, but always interested in the workings of a freak, she tagged along. I told her that no little old two-foot snake could really do any harm to me. (I said two-foot, but I was thinking of the four-foot monster that awaited me). After all, his little old inch-wide mouth couldn't open very wide. (I said inch, but I was thinking of the three-inch gap that awaited.) The only reply I got was, "I think you're crazy!"

With cage on the table, knees knocking, heart pounding, hand shaking, I removed the lid and with the supporting help of my most able assistant, got the six-foot serpent (it seemed that long, anyway) onto a yardstick and out into the open room. I waved my hand at it from the short distance of three feet. It turned its head the other way. I moved my hand to two feet, six inches. No response. Two feet. Huh. Ah, brave soul, six inches. WOW! Open mouth, hiss-s-s, strike, in just that order. Nope, must have missed, because although my hand automatically moved away, there was no difference in feeling. Six inches again. Another strike! It clamped down. No feeling. Well! I waved my hand again; no reaction. I hit it on the nose, batted its head, squeezed it, but with no response. It just moved and wiggled where it pleased. When my finger was examined, there were two tiny spots of blood where the back teeth of the lower jaw had taken hold. When it was wiped away (it was already dry), no marks remained.

"How hard can a two-foot pine snake bite?"

Tap your finger with a piece of coarse sandpaper. You have just felt the answer. OUCH!

LUNG CANCER AND SMOKING, Charles S. Cameron, M.D., *Ladies Home Journal*, Dec. 1956, pp. 160-162.

There is much confusion on the smoking-cancer problem. This article discusses the increase in cancer detection and the possible causes. The author takes the view that possibly several causative agents are involved one of which could be smoking.

A-V NEWS

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Our sincere thanks to all those who attended the Film-Filmstrip Preview Sessions at New York City in late December. It will be our aim to present again in December 1957 the newest and best of the films and filmstrips released by that time. A special invitation is extended to NABT members in the Indianapolis area to participate in scheduling and showing these film materials next December. Please write of your interest to the chairman of the A-V Committee. A list of the films and filmstrips shown at New York City appeared in the December 1956 issue. Please add the following to your copy:

PLANTS MAKE FOOD. Churchill-Wexler; 11″; upper grades (elementary).

AMPHIBIANS: FROGS, TOADS AND SALAMANDERS. Film Associates of California; 11″; upper elementary and junior high.

A golden opportunity presents itself to biology teachers in the Northeast this spring, when New York City will be host to the annual Golden Reel Film Festival and Sound Slidefilm Competition, April 22 through 26. Complete information concerning this event may be obtained from the Film Council of America, 614 Davis St., Evanston, Ill.

The Motion Picture Service of the U. S. Department of Agriculture has announced a consolidation of all its listings of television film clips into one large, well-indexed volume. This new publication is expected to be available by the time when the current issue of the ABT goes to press, and it should add to the convenience of persons searching for agricultural scenes to fit into television programs.

Featuring a unique "inside-out" filmstrip feed mechanism, a new DuKane automatic sound slidefilm projector offers much to prospective users. The unusual mechanism feeds film into the projector from the inside of the film roll, and mechanically winds the used filmstrip into its storage container, ready for the next showing. In addition, there has been developed an improved air cooling system, and there appears to be virtual elimination of the possibility of film scratching during projection. Audio-Visual Division, DuKane Corporation, St. Charles, Ill.

The Victor Magnascope V200 is the newest entry in the micro-projection field. It is lightweight, conpact and versatile; it has a 200-watt lamp; it offers 10x, 16x, and 43x objectives. Victor Animatograph Corporation, Davenport, Iowa.

The Levolor A. V. Blind permits darkening of a room in a few seconds, by virtue of a motorized device operated by the mere push of a button. Details may be obtained from Levolor Lorentzen, Inc., 720 Monroe St., Hoboken, N. J.

Recent Film and Filmstrip Releases

EXPLORING YOUR GROWTH. 11 min., sd., color. The latest in the group designed to accompany the Heath (Elementary) Science Series; a well-done presentation of a topic which has had limited coverage for elementary pupils. Intermediate grades. Churchill-Wexler Film Productions, 801 North Seward St., Los Angeles 38, Calif.

PLANTS AND ANIMALS Filmstrip Series. Five filmstrips in full color, from photographs, the set illustrates the many ways

whereby man benefits from plants and animals by means of their products and services. *Plants and the Things We Use; Plants Help Us; Animals and the Things We Use; Animals Help Us; Man Improves Plants and Animals.* Intermediate grades. Young America Films, Inc., 18 East 41st St., New York 17, N. Y.

ELEMENTARY SCIENCE SET NO. 5 (Filmstrip Series). Six filmstrips in color, using photographs and artwork; a heterogeneous grouping of science topics designed to augment elementary science text series. *The Aquarium; How Animals Are Grouped; How Airplanes Fly; How a Plant Grows; How a Plant Makes Food; A Trip to the Weather Station.* Elementary grades. Young America.

BIRDS OF THE PRAIRIE MARSHES. 10", sd., color. Survey of Canadian prairie marsh waterfowl, including some raised in permanent captivity, and others who are seasonal visitors. National Film Board of Canada, 630 Fifth Avenue, New York 20, N. Y.

BUTTERFLY MYSTERY. 10", sd., color. Butterfly reproduction, and the stages of complete metamorphosis. Elementary. Moody Institute of Science, 11428 Santa Monica Blvd., West Los Angeles 25, Calif.

FOOD GETTING AMONG ANIMALS. 12", sd., color. Feeding habits and adaptations of the anteater, rattlesnake, barnacle, archer fish, and chameleon. Junior to senior high. Moody.

ENDOCRINE GLANDS–HOW THEY AFFECT YOU. 15", sd., b & w. Location, functions and effects of eight endocrine glands. Jr.-sr. high. McGraw-Hill Book Co., Text-Film Dept., 330 West 42nd St., New York 36, N. Y.

WORLD OF WATER. 10", sd., color. Introduction to several tropical fish, in the Bronx Zoo aquarium, including the African Lungfish, Arowana, Kissing Gouramis, and Piranha. General interest. McGraw-Hill.

LIFE IN A CELL. 14", sd., color. Life functions as carried on in a cell; classification of one-celled organisms; scientific interest in single cells. Great Commission Films, 4626 Van Nuys Blvd., Sherman Oaks, Calif.

ON THE BORDER OF LIFE. 20", sd., b & w, by subscription only. Accomplishments of man in breeding various creatures of similar and differing characteristics. Society for French American Cultural Services and Educational Aid, 972 Fifth Ave., New York 21, N. Y.

WOOD DUCK WAYS: A TREE-NESTING DUCK REARS A FAMILY. 20", sd., color. Appearance, nesting behavior, rearing of young, man's role in encouraging wood ducks to nest in selected areas. Jr-sr. high and college. University of Minnesota, Audio-Visual Education Service, Minneapolis 14, Minn.

THE GREAT ADVENTURE. 75", sd., b & w. Produced in Sweden, this remarkable film presents a vivid naturelogue, in which the featured actors are foxes, otter, various wild creatures, and two young boys. Interrelationships are brought out as cycles within cycles, in a dramatic, authentic story. Upper elementary to college. Louis de Rochemont Associates Film Library, 13 East 37th St., New York 16, N. Y.

PROTECTING FRESH WATER GAME FISH. Black & White filmstrip, 30 frames. Importance of habitat, and conservation measures needed for habitat protection; fish hatchery operation. Jr. high. Visual Education Consultants, Inc., 2066 Helena St., Madison 6, Wis.

SPINAL COLUMN: STRUCTURE AND FUNCTION IN MAN. 11", sd., b & w. X-ray photography and animation used to study structure in detail; proper functioning and role of correct posture. Sr. high. Encyclopedia Brittanica Films, Inc., Wilmette, Ill.

THE AGRICULTURE STORY. 13½", sd., color. Why American agriculture is the most efficient and productive agriculture in world history; contributions of research, farmers, machines, USDA, land-grant colleges. Sr. high and up. U. S. Department of Agriculture, Washington 25, D. C.

TREE BANK. 12½", sd., color. How tree planting fits into the Agricultural Soil Bank program; multiple values of tree plantations; planting procedures; acceptable types of cropland. Sr. high and up. U. S. Department of Agriculture.

THE STORY OF CITRUS FRUITS. 11", sd., color. The cultivation and processing of citrus fruits, in story form. Intermediate grades. Coronet Films, Coronet Building, Chicago 1, Ill.

TIMBER RESOURCE REVIEW. 6½", sd., color. An animated film, highlighting the recently-completed nationwide survey of

America's timber resources by the U. S. Forest Service. Jr. high and up. U. S. Department of Agriculture; loaned from regional offices of the Forest Service.

CRUSTACEANS. 13″, sd., color. Appearance, habitat, and behavior of significant types of crustaceans. Upper elementary to sr. high. Encyclopedia Brittanica Films.

STEM RUST. 13½″, sd., color. The life history, effects, host plants, and control of the fungus disease that destroys wheat, oats, barley and rye. Sr. high and up. U. S. Department of Agriculture. (Distribution of prints limited to principal wheat-growing states.)

MAN AGAINST A FUNGUS. 37″, sd., color. The life history and control of the wheat rust fungus, with details of the complex alternation of generations; use of animation, time-lapse and cinephotomicrography. College. National Film Board of Canada.

FOREST TENT CATERPILLAR. 18″, sd., color. The life cycle, habits, effects and control of this major insect pest. Jr. high and up. National Film Board of Canada.

INSECTS ASTRAY. 25″, sd., b & w. An expansion of the thesis that the clothes moth moved indoors from its original habitat because of easier living; and that, as we make our wools and furs insect-proof, there would be a migration back to the original habitat. Sr. high and up. Canadian Film Institute, 142 Sparks St., Ottawa, Ontario, Canada.

BIRD NEIGHBORS. 10″, sd., color. Observation of about 15 common birds of the more northern states, in their natural surroundings. Elementary grades. National Film Board of Canada.

SMALLER LAND MAMMALS (Rodents); SMALLER LAND MAMMALS (Flesh Eaters); SMALLER LAND MAMMALS (Moles, Shrews, Bats, etc.). Three filmstrips in natural color, each about 35 frames. The set of three units is an excellent contribution to any classroom, and provides much material for study; especially useful in all but the southernmost states; fine color rendition. Elementary grades to college. National Film Board of Canada.

THE FROG. Color filmstrip, about 27 frames. Elementary survey of the development of the frog, plus observations of frog's enemies and of a few species of frogs. Intermediate grades. National Film Board of Canada.

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Summer Institute at Indiana University

For the second year, the NABT will be cooperating organization for the Institute for Teachers of High School Biology at Indiana University, Bloomington, Indiana. The Institute is one of five to be given this summer specifically for biology teachers under grants by the National Science Foundation. The dates for the Institute will be June 24 through August 2.

The NSF policy of $75 payment per week to each participant, $15 per week for each dependent, tuition expenses, and travel allowance to and from the campus will be followed.

The program will be limited to 35 participants. It will include week-long sessions on genetics, embryology, endocrinology, ecology, bacteriology, plant physiology, and protozoology. This will be a specially designed curriculum, not a regular summer school offering. Scheduled are field trips, demonstrations, laboratory periods, discussions and lectures by competent authorities in the areas.

The new Jordan Hall, air-conditioned and fully equipped, will be the site of the Institute. Housing facilities will be in nearby Forest Hall. Since the purpose of the Institute program is to bring the biology teacher up to date in his laboratory and field experience, a great deal of freedom will be permitted in the use of the labs, and the participant will be encouraged to assume initiative in his lab and field work. For application blanks write to Paul Klinge, Assistant Director, Institute for High School Biology Teachers, Howe High School, Indianapolis 7, Indiana.

Books for Biologists

THE ORIGINS AND PREHISTORY OF LANGUAGE, P. W. Bridgman, 576 pp., $6.00, Philosophical Library, New York, New York, 1955.

This collection comprises the bulk of the nontechnical writings of Dr. Bridgman together with three papers published here for the first time. The topics range over a considerable field, but there is a certain unity in the treatment in that "operational" is used throughout.

A-V News

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THE COLOUR OF LIFE. 24″, sd., color. The never-ending miracle of the development of a seedling tree, the springing up of a forest giant, and the remarkable processes within a single leaf. Jr. high and up. National Film Board of Canada.

LIFE CYCLE OF A PLANT. 10″, sd., b & w. All phases of a common plant's life history. Upper elementary. United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

LIVING AND NON-LIVING THINGS. 10″, sd., b & w. Simple objects are observed with relation to their existence as living or non-living; differences between plants and animals. Elementary. United World Films.

STORY OF THE BEES. 20″, sd., b & w. Life cycle of the honey bee; division of labor; community life. Elementary. United World Films.

STORY OF THE FROG. 13″, sd., b & w. Primarily an account of the life processes, including digestion, assimilation, elimination and circulation; use of animation, slow motion, X-ray photography. Upper elementary. United World Films.

THE CHAMELEON. 8″, sd., color. Characteristics and habits of the chameleon; color changes of skin, in response to temperament and light changes; independence of eye movement; details of insect-catching. Upper elementary and up. International Fim Bureau, Inc., 57 East Jackson Blvd., Chicago 4, Ill.

THE OSTRICH. 7″, sd., color. Details of appearance of the ostrich, as seen in South Africa; feeding, movement, nesting behavior, appearance of young. Upper elementary and up. International Film Bureau.

THE WOODCOCK. 6″, sd., color. Appearance, habitat and camouflage of the familiar woodcock; nesting and feeding habits; protection of eggs and young. Upper elementary and up. International Film Bureau.